

ISS and Human Research Project Office Highlights

November 6, 2009

ISS Research Program

CCF completes integration and verification testing with MSG Engineering Unit.

The Critical Velocities in Open Capillary Channel Flows (CCF) flight hardware has successfully completed integration and verification testing with the Microgravity Science Glovebox (MSG) Engineering Unit the week of October 19-2009. Scheduled for 19A shuttle launch on March 18, 2010, CCF is a German Space Agency project in collaboration with NASA which will study forced liquid flows through open capillary channels with free liquid surfaces in the Microgravity Science Glovebox (MSG) onboard ISS. Technologies for liquid management in space use capillary forces to position and transport liquids, since the hydrostatic pressure is absent which gives the liquid a defined surface and enables easy withdrawal from the tank bottom. For the application of open channels in propellant tanks of spacecrafts, design knowledge of these limitations are a requirement, predicated with a bubble free liquid restriction prior to entering the thrusters. The current design of spacecraft fuel tanks relies on an additional reservoir to prevent the ingestion of gas into the engines during firing. The CCF experiment will determine the shape of the free surface and find the maximum flow rate achievable in an open channel without a collapse of the free surface. These results will lead to improved reliability design for liquid and propellant management in space, equating to more efficient storage utilization. (POC: MAH/Donna Bohman, (216) 433-8860)

BCAT-5 starts operations on ISS.

The BCAT-5 experiment has started operations on the International Space Station (ISS). It contains experiments from five teams of scientists and is the first stand-alone experiment to be run in the Japanese Experiment Module (JEM) on the ISS. Figure 1 below shows the BCAT-5 hardware setup along with its accompanying camera and flash. Figure 2 shows an image captured by the EarthKAM software on ISS, which automatically sends down copies of the pictures taken by the camera to the science teams back on Earth. The quick availability of these images enables scientists to provide rapid feedback to the astronauts and to get an idea of how their experiment is progressing since results are often quite different when the effects of gravity are removed. In this case, Canadian Space Agency (CSA) astronaut Bob Thirsk setup and initialized the BCAT-5 experiment which then began taking a series of pictures of sample 6 (one of ten possible samples). This sample belongs to Investigators Professor Barbara Frisken and Dr. Arthur Bailey at Simon Fraser University in Canada; these scientists are working with NASA through the Canadian Space Agency. This sample (Figure 3) is a new class of the BCAT experiment, which studies the competition between phase separation (which you often see when you look at a salad dressing that needs to be shaken) and crystallization (which is a more ordered state) seen mostly on the right side of the sample. This competition is often seen as a problem when plastics are extruded with defects, but the science of what is happening is masked by gravity on earth, where sedimentation causes some of the stuff you are trying to study to jam and to drop to the bottom of the sample. Sample 6 is just beginning to crystallize on the ISS; which is a more ordered state for Sample 6 which is now in free-fall. A new generation of quick “wait-less” experiments like BCAT-5 on the ISS is providing scientists with pleasant surprises and new

insights into competing processes that are masked by gravity on Earth. (POC: MAH/Donna Bohman, (216) 433-8860; NCSER/William Meyer (216) 433-5011)



Fig. 1 BCAT-5 hardware setup

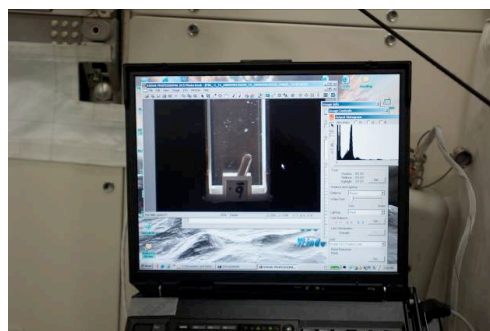


Fig. 2 BCAT-5 EarthKAM Image

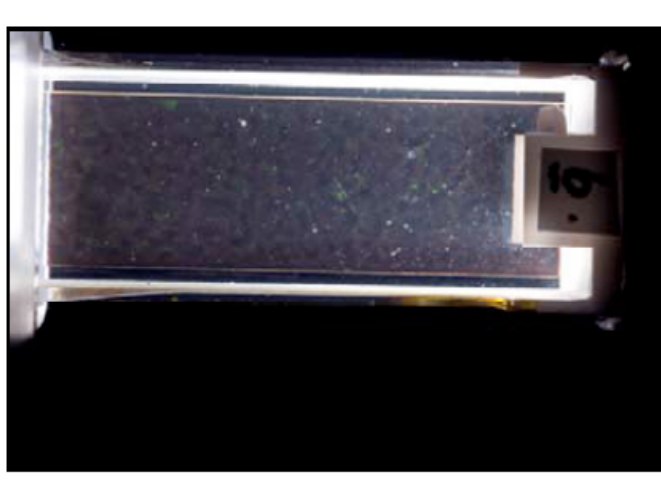


Fig. 3 BCAT-5 Sample 6 Early Stages of Phase Separation (left) and Crystallization (right)

Materials International Space Station Experiment 6A & 6B (MISSE 6A & 6B) Post-Flight Examination.

From the Space Experiments and Environment Branch (RES), Kim de Groh and Viet Nguyen visited NASA Langley Research Center on October 20 and 21, 2009, to participate in the MISSE 6A & 6B post-flight clean-room opening and flight experiment inspection. MISSE 6A & 6B, which includes 11 Glenn experiments with 168 samples, were successfully retrieved from the Columbus Laboratory on September 1, 2009, and returned to Earth during the STS-128 mission after 1.45 years of space exposure. Kim and Viet took photos of the experiments and samples, and noted various environmental degradation observations. The clean-room photographs will be compared with on-orbit photographs, and experiment photos to be taken once the experiments are returned to Glenn. In general all the experiments looked good, and it appears that they will provide meaningful environmental data. Some of the specific clean-room observations include: shadowing effects around fasteners on a particular experiment, preferential tensile sample failure of ram facing spring-loaded samples (with no failure to non-spring-loaded ram samples, or wake facing spring-loaded samples), and possible higher atomic oxygen erosion rates of some stressed

polymer samples, as compared to identical non-stressed samples. The experiments are being de-integrated from the MISSE trays, and will be returned to Glenn, during the week of October 26 to 30, 2009. This work is supported by the ISS Research Project. (POC: RES/Kim de Groh, (216) 433-2297; RES/Viet Nguyen, (216) 433-6147)

ISS Research Project Presentation at the ETDP TIM

The ISS Research Project presented a project overview at the Exploration Technology Development Program (ETDP) Technical Interchange Meeting (TIM) at Ames Research Center (ARC) on November 3, 2009. We covered project organization, content, recent highlights and accomplishments for both Life and Physical Sciences, and relationships to other ETDP technology projects. Sid Sun and Fred Kohl double teamed in a 35-minute+ tour-de-force presentation of ISS Research. We had some questions and several off-line inquiries and comments. Bhim Singh, Sid Sun and John Hines represented the Project at the “ETDP Special Session/Planning Meeting” on November 5, 2009. (POC: MAH/Fred Kohl, (216) 433-2866)

Human Research Program

IVGEN hardware shipped to KSC.

The Intravenous Water Feneration (IVGEN) Project passed its System Acceptance Review-II and the hardware was shipped to Kennedy Space Center (KSC) for processing. It arrived at KSC on October 29, 2009.

Additional hardware that will be launched in the shuttle middeck will be shipped in late January, 2010. (POC: MAH/DeVon Griffin, (216) 433-8109)